Final

Total Maximum Daily Load

for

Fecal Coliform

in

Anclote River (Freshwater)

WBID 1440F

May 2012

Region4 serving the southeast

In compliance with the provisions of the Federal Clean Water Act, 33 U.S.C §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 400-4, the U.S. Environmental Protection Agency is hereby establishing the Total Maximum Daily Load (TMDL) for fecal coliform bacteria in Anclote River in the Springs Coast Basin (WBID 1440F). Subsequent actions must be consistent with this TMDL.

/s/ 5/30/2012

James D. Giattina, Director Date

Water Protection Division

Table of Contents

Table of Figures

Table of Tables

LIST OF ABBREVIATIONS

BMAP	Basin Management Action Plan
BMP	Best Management Practices
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FLUCCS	Florida Land Use Classification Code System
FS	Florida Statutes
HUC	Hydrologic Unit Code
IWR	Impaired Waters Rule
LA	Load Allocation
MGD	Million Gallons Per Day
ML/L	Milliliters Per Liter
MOS	Margin of Safety
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer Systems
N/A	Not Applicable
NASS	National Agriculture Statistics Service
NPDES	National Pollutant Discharge Elimination System
OSTD	Onsite Sewer Treatment and Disposal Systems
SEC/DAY	Seconds Per Day
STORET	STORage RETrieval database
SQ MI	Square Miles
SWFWMD	Southwest Florida Water Management District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WBID	Water Body Identification
WLA	Waste Load Allocation
WMD	Water Management District
WQS	Water Quality Standard
WWTP	Wastewater Treatment Plant

SUMMARY SHEET

Total Maximum Daily Load (TMDL)

1. 303(d) Listed Segment:

WBID	Segment Name	Class and Waterbody Type	Major River Basin	HUC	County	State
1440F	Anclote River Freshwater	Class III Freshwater	Springs Coast	03100207	Pasco	Florida

2. TMDL Endpoints/Targets: Fecal Coliform

3. TMDL Technical Approach: Statistical approach using available water quality data.

4. TMDL Waste Load and Load Allocation:

Waterbody	WBID	WLA[1]		LA	TMDL
		Facility (MPN/day)	Stormwater/MS4 (% Reduction)[2]	(% Reduction)[2]	(% Reduction)[2]
Anclote River Freshwater	1440F	N/A	38%	38%	38%

Notes:

1. The WLA is typically separated into the components originating from continuous wastewater NPDES facilities (e.g. WWTPs) and from stormwater NPDES permitted facilities/public bodies (e.g. MS4s).
2. Overall percent reduction required to achieve the 400 counts/100 ml fecal coliform criterion. The MOS is implicit and does not take away from the TMDL value.

5. Endangered Species (yes or blank):

6. USEPA Lead TMDL or Other: USEPA

7. TMDL Considers Point Sources/Non Point Sources: Both

8. NPDES Discharge to surface water addressed in TMDL: Yes

Facility Name	NPDES No.	Facility Type	Receiving Stream
Pasco County	FLS000032	MS4 (Phase I)	Multiple

Note: Eight cities, towns, and other public bodies are listed as co-permittees under this NPDES Permit.

1. Introduction

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting Water Quality Standards (WQS). The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

The Florida Department of Environmental Protection (FDEP) developed a statewide, watershed-based approach to water resource management. Under the watershed management approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework FDEP uses for implementing TMDLs. The state's 52 basins are divided into five groups. Water quality is assessed in each group on a rotating five-year cycle. FDEP also established five water management districts (WMD) responsible for managing ground and surface water supplies in the counties encompassing the districts. Anclote River is located in the Springs Coast River Basin and is a Group 5 waterbody managed by the Southwest Florida Water Management District (SWFWMD).

For the purpose of planning and management, the WMD divided the districts into planning units defined as either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. Anclote River is located within the Anclote River/Coastal Pinellas Planning Unit. These planning units contain smaller, hydrological based units called drainage basins, which are further divided by FDEP into "water segments." A water segment usually contains only one unique waterbody type (stream, lake, canal, etc.) and is about 5 square miles. Unique numbers or waterbody identification (WBIDs) numbers are assigned to each water segment. This TMDL report addresses WBID 1440F (Anclote River Freshwater).

2. Problem Definition

To determine the status of surface water quality in Florida, three categories of data – chemistry data, biological data, and fish consumption advisories – were evaluated to determine potential impairments. The level of impairment is defined in the Identification of Impaired Surface Waters Rule (IWR), Section 62-303 of the Florida Administrative Code (FAC). The IWR is FDEP's methodology for determining whether waters should be included on the state's planning list and verified list. Potential impairments are determined by assessing whether a waterbody meets the criteria for inclusion on the planning list. Once a waterbody is on the planning list, additional data and information

will be collected and examined to determine if the water should be included on the verified list.

The TMDL addressed in this document is being established pursuant to commitments made by the United States Environmental Protection Agency (USEPA) in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). That Consent Decree established a schedule for TMDL development for waters listed on Florida's USEPA approved 1998 303(d) list. The 1998 303(d) list identified numerous WBIDs in the Springs Coast River Basin as not meeting WQS. After assessing all readily available water quality data, the USEPA is responsible for developing a TMDL for WBID 1440F (Anclote River Freshwater). The geographic location of this WBID is shown in Figure 1. The parameter addressed in this TMDL is fecal coliform.

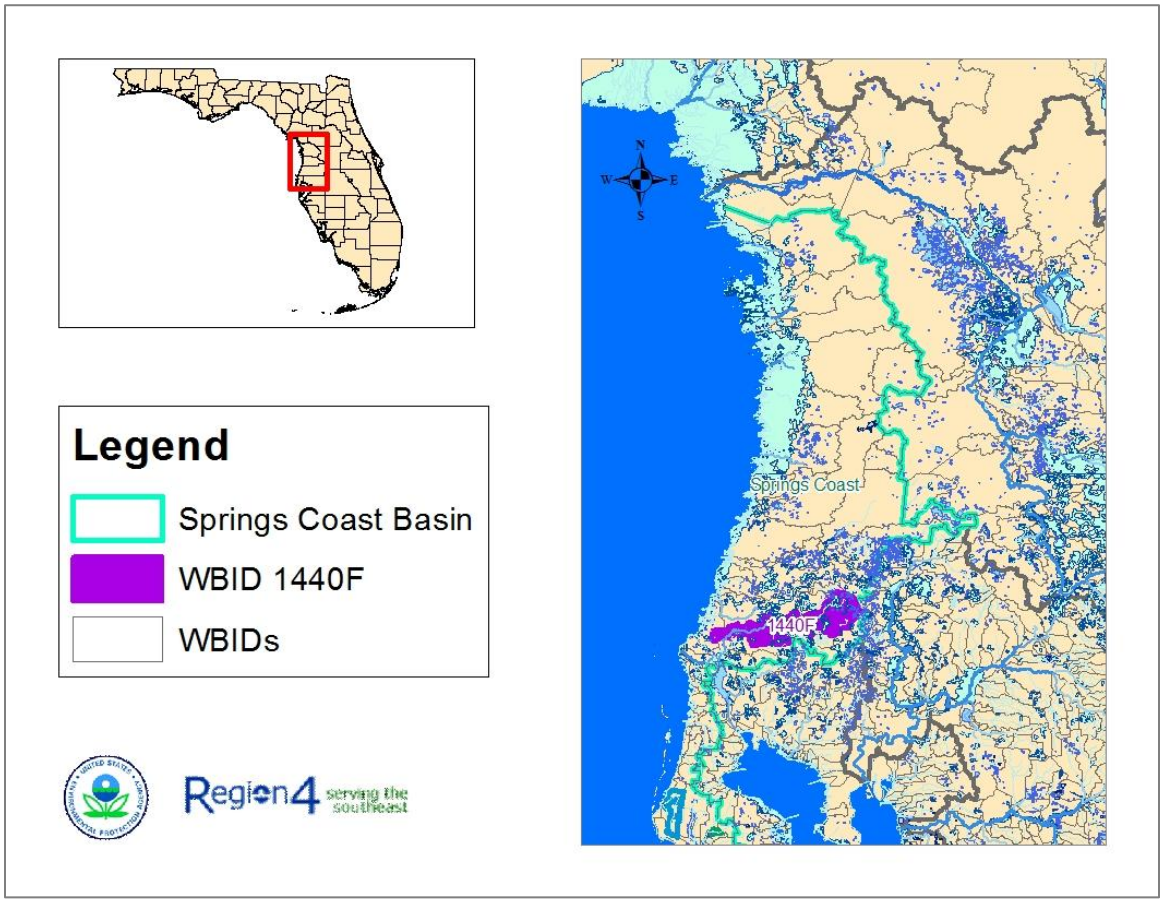

Figure 1 Location of WBID 1440F – Anclote River (Freshwater)

3. Watershed Description

Anclote River originates in swampy lowlands in south central Pasco County, east of New Port Richey, and flows southwest until emptying into the Gulf of Mexico at Anclote Anchorage (FDEP, 2008). Anclote Anchorage is a shallow area of seagrass beds which

provide breeding habitats for numerous marine species. WBID 1440F is a freshwater segment of Anclote River and is located in the southwestern portion of Pasco County, approximately 10 miles upstream of Anclote Anchorage.

The Jay B. Starkey Wilderness Park (Figure 2) is located in the middle of WBID 1440F. This park is managed by Pasco County and offers hiking, biking and equestrian trails. The Jay B. Starkey Wilderness Park is one of three tracts of land contained within the Starkey Wilderness Preserve. The Serenova Tract, located to the north and Anclote River Ranch Tract, located to the south are also included within the Starkey Wilderness Preserve. The Serenova Tract and the Jay B. Starkey Wilderness Park combined form a 6,000 acre wetland ecosystem spread throughout approximately 18,000 acres of conservation lands (www.swfwmd.state.fl.us/recreation/areas/starkeywilderness.html).

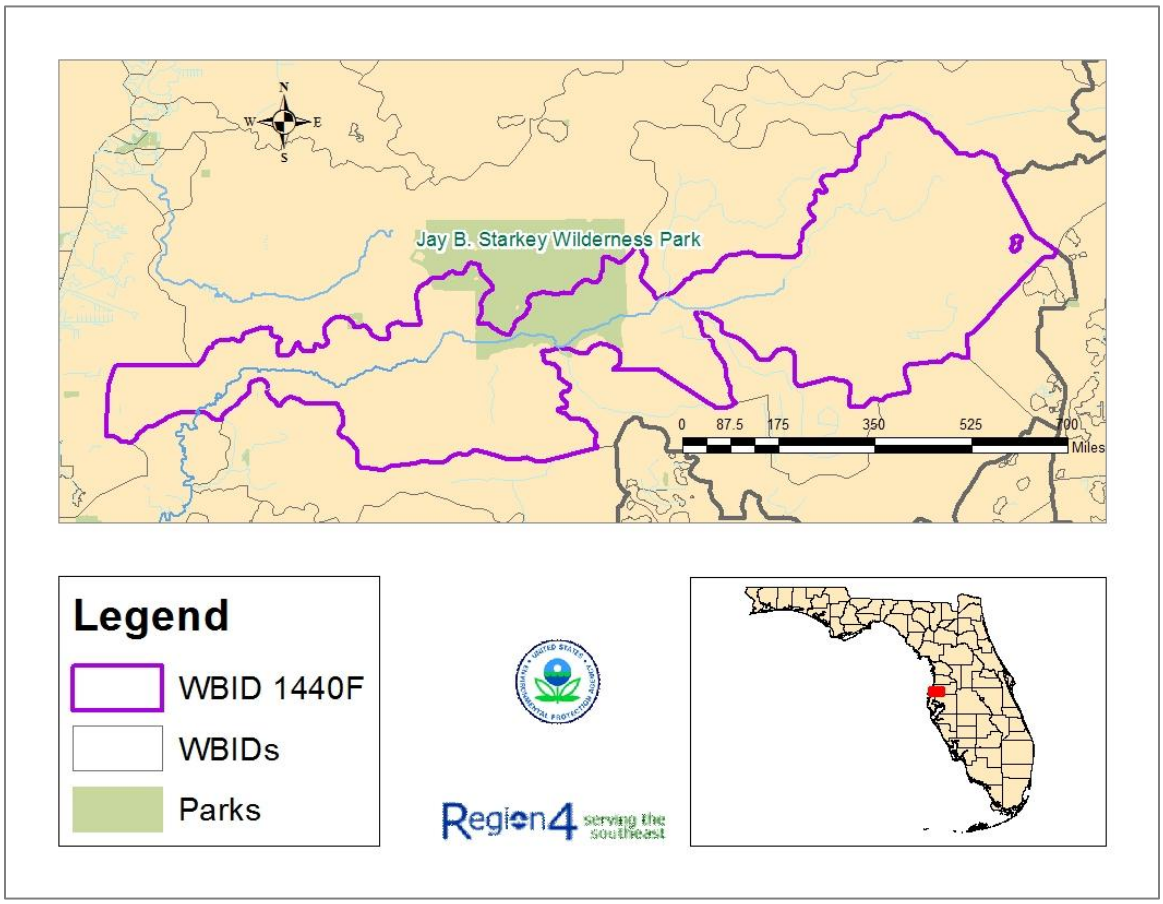

Figure 2 Location of Jay B. Starkey Wilderness Park

WBID 1440F drains approximately 26,502 acres (41.4 mi^2) and consists primarily of agriculture in the west and southern regions, forests and wetlands in the northern-central region and urban development in the east (Figure 3). A breakdown of landuse by acreage and percentage is provided below in Table 1. The latest landuse coverages were obtained from the FDEP FTP site. The landuses are based on 2004 land cover features and are classified using the Level 1 Florida Landuse Classification Code (FLUCC).

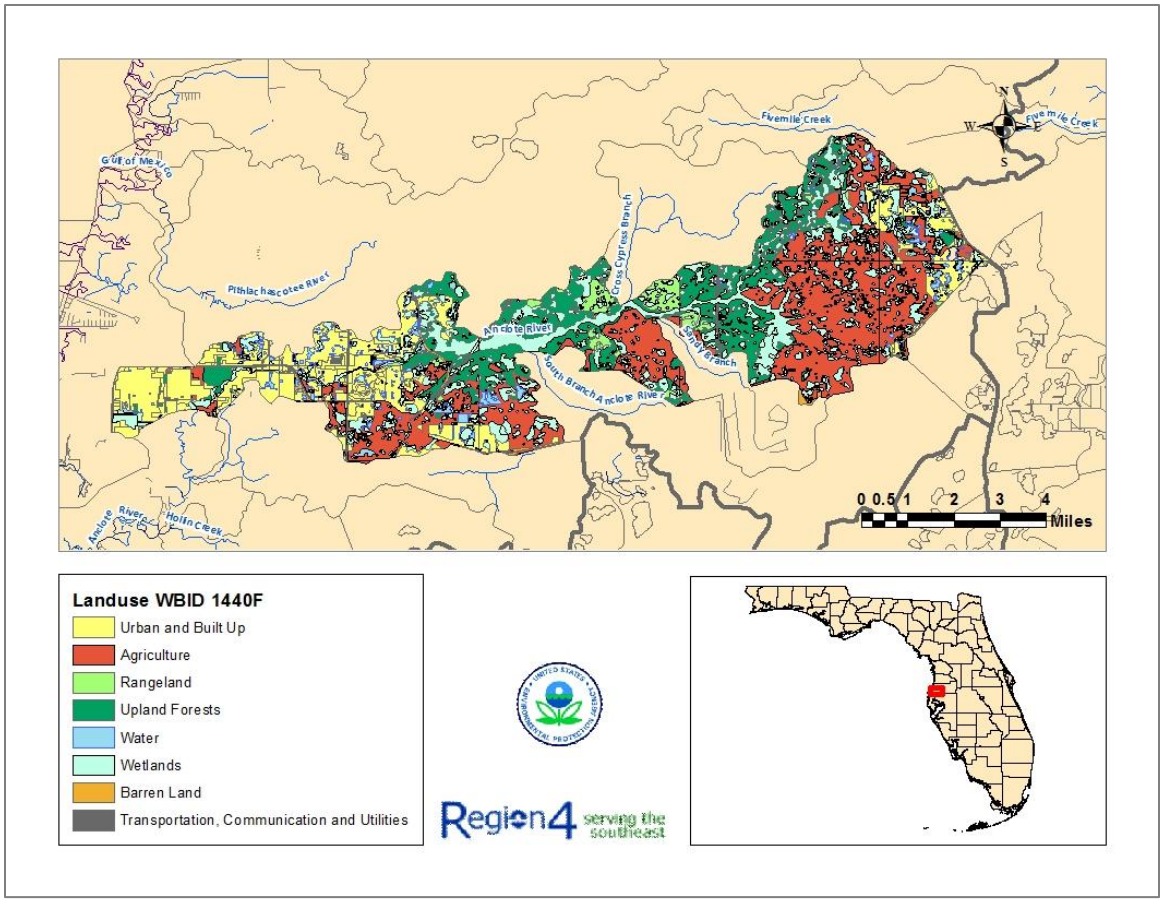

Figure 3 Anclote River (Freshwater) – WBID 1440F Landuse Distribution

Table 1 Landuse Distribution in WBID 1440F: Anclote River (Freshwater)

Impaired Waterbody	WBID	Unit[1]	Urban Residential & Built-Up[2]	Agriculture	Rangeland	Forest	Water	Wetlands	Barren Land	Transportation & Utilities	Total
Anclote River (Freshwater)	1440F	acres	5043	7875	700	4747	673	6975	165	324	26,502
		percent	19.0	29.7	2.6	17.9	2.5	26.3	0.6	1.2	100%

Notes:

1. Areas in the table represent the watershed within WBID 1440F.
2. The urban/residential and built-up category includes commercial, industrial and extractive uses.

There is no known wastewater National Pollutant Discharge Elimination System (NPDES) permitted surface water discharge within the watershed. WBID 1440F lies within the Municipal Separate Storm Sewer System (MS4) permitted service area for Pasco County (FLS000032). The MS4 includes ditches, curbs, gutters, storm sewers, and

similar means of collecting or conveying runoff that does not connect with a wastewater collection system or treatment plant.

4. Water Quality Standards/TMDL Targets

Anclote River Freshwater, specifically WBID 1440F, is a Class III Freshwater waterbody with a designated use of Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. Designated use classifications are described in FAC Section 62-302.400(1), and water quality criteria for protection of all classes of waters are established in FAC Section 62-302.530. Individual criteria should be considered in conjunction with other provisions in water quality standards, including Section 62-302.500 FAC. [Surface Waters: Minimum Criteria, General Criteria] that apply to all waters unless alternative criteria are specified in FAC Section 62-302.530.

4.1. Fecal Coliform Bacteria (Class III Waters)

The most probable number (MPN) or membrane filter (MF) counts per 100 ml of fecal coliform bacteria shall not exceed a monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period.

The geometric mean criteria reflect chronic or long-term water quality conditions, whereas the 400 and 800 values reflect acute or short-term conditions. It was not possible to assess against the geometric mean criteria due to insufficient fecal coliform data. The 400 count/100 ml criterion was selected as the TMDL endpoint. EPA believes implementation of the percent reduction required in this TMDL will achieve restoration of the waterbody. EPA assumes that the best management practices that will be used to achieve the prescribed reductions will ensure that all three parts of the standard will be met. Florida's continued monitoring and assessment of this waterbody will provide the data and information necessary to demonstrate whether the waterbody is fully restored.

5. Water Quality Assessment

WBID 1440F, Anclote River, was listed as not attaining its designated uses on Florida's 1998 303(d) list for fecal coliform. To determine impairment an assessment of available data was conducted. The source for current ambient monitoring data for WBID 1440F was the IWR data Run 44. The IWR database contains data from various sources within the state of Florida, including the WMDs and counties.

5.1. Water Quality Data

The table and figures presented in this section provide the station locations and time series data for fecal coliform bacteria for WBID 1440F, Anclote River. Table 2 provides a list of the monitoring stations in WBID 1440F, including the data range of the

observations and the number of observations. Figure 4 illustrates where the IWR stations are located within the WBID.

Table 2 Water Quality Monitoring Stations for WBID 1440F: Anclote River (Freshwater)

Station	Station Name	First Date	Last Date	No. Obs
21FLGW 17955	SWA-LR-1016 ANCLOTE RIVER	6/18/2003	6/18/2003	1
21FLGW 17963	SWA-LR-1026 ANCLOTE RIVER	6/11/2003	6/11/2003	1
21FLGW 20061	SWA-SS-1026 UNNAMED SMALL STREAM	9/11/2003	9/11/2003	1
21FLGW 34680	SW5-LR-2003 ANCLOTE RIVER	6/25/2008	6/25/2008	1
21FLGW 34682	SW5-LR-2007 ANCLOTE RIVER	6/19/2008	6/19/2008	1
21FLGW 34684	SW5-LR-2012 ANCLOTE RIVER	6/24/2008	6/24/2008	1
21FLGW 34685	SW5-LR-2013 ANCLOTE RIVER	6/26/2008	6/26/2008	1
21FLGW 34687	SW5-LR-2016 ANCLOTE RIVER	6/24/2008	6/24/2008	1
21FLGW 34688	SW5-LR-2017 ANCLOTE RIVER	6/23/2008	6/23/2008	1
21FLGW 34689	SW5-LR-2019 ANCLOTE RIVER	6/9/2008	6/9/2008	1
21FLGW 34693	SW5-LR-2027 ANCLOTE RIVER	6/25/2008	6/25/2008	1
21FLGW 34694	SW5-LR-2028 ANCLOTE RIVER	6/23/2008	6/23/2008	1
21FLGW 34698	SW5-LR-2033 ANCLOTE RIVER	7/10/2008	7/10/2008	1
21FLGW 34699	SW5-LR-2034 ANCLOTE RIVER	7/14/2008	7/14/2008	1
21FLGW 34700	SW5-LR-2035 ANCLOTE RIVER	7/10/2008	7/10/2008	1
21FLGW 34701	SW5-LR-2036 ANCLOTE RIVER	7/15/2008	7/15/2008	1
21FLGW 34702	SW5-LR-2037 ANCLOTE RIVER	7/14/2008	7/14/2008	1
21FLGW 34703	SW5-LR-2038 ANCLOTE RIVER	7/15/2008	7/15/2008	1
21FLGW 34704	SW5-LR-2039 ANCLOTE RIVER	7/16/2008	7/16/2008	1
21FLGW 34706	SW5-LR-2041 ANCLOTE RIVER	7/16/2008	7/16/2008	1
21FLGW 34707	SW5-LR-2042 ANCLOTE RIVER	7/16/2008	7/16/2008	1
21FLGW 3509	ANCLOTE RIVER MOUTH AT S.R. 54	1/8/2002	12/7/2010	106
21FLGW 37001	Z4-LR-3016 ANCLOTE RIVER	4/16/2009	4/16/2009	1
21FLGW 37006	Z4-LR-3032 ANCLOTE RIVER	4/28/2009	4/28/2009	1
21FLGW 37942	Z4-LR-3016R ANCLOTE RIVER	10/12/2009	10/12/2009	1
21FLGW 37947	Z4-LR-3032R ANCLOTE RIVER	10/8/2009	10/8/2009	1

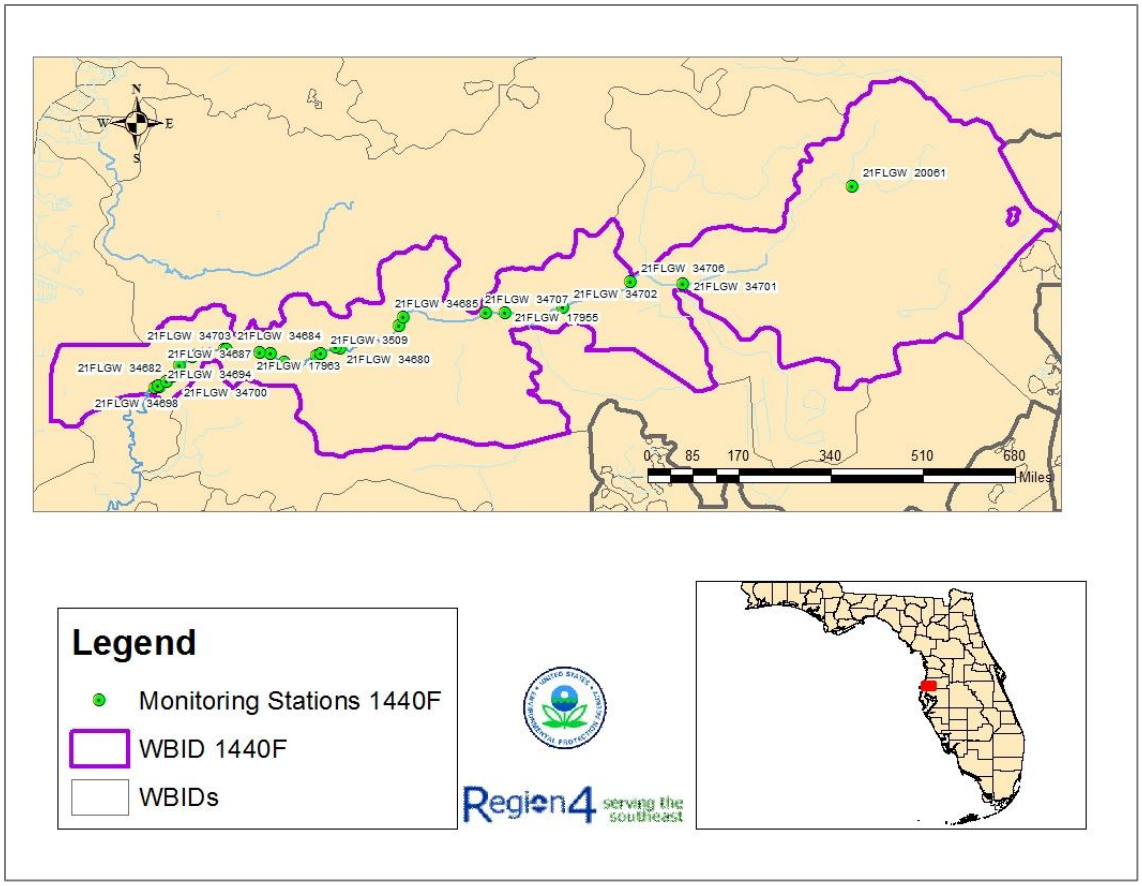

Figure 4 Station Locations for WBID 1440F: Anclote River

Several of the monitoring stations are located within close proximity to each other (within 200 meters) and therefore are considered to be the same sampling locations. Table 3 provides the list of monitoring stations affected and the identification number given to each group for purpose of this TMDL. The locations of the groups are depicted on Figure 5.

Table 3 List of Monitoring Stations Grouped Together

Monitoring Station	Group Number
21FLGW 34689	Group 1
21FLGW 34698	Group 1
21FLGW 37001	Group 1
21FLGW 37942	Group 1
21FLGW 34684	Group 2
21FLGW 34703	Group 2
21FLGW 37006	Group 3
21FLGW 37947	Group 3
21FLGW 3509	Group 4
21FLGW 34699	Group 4
21FLGW 17963	Group 5
21FLGW 34680	Group 5

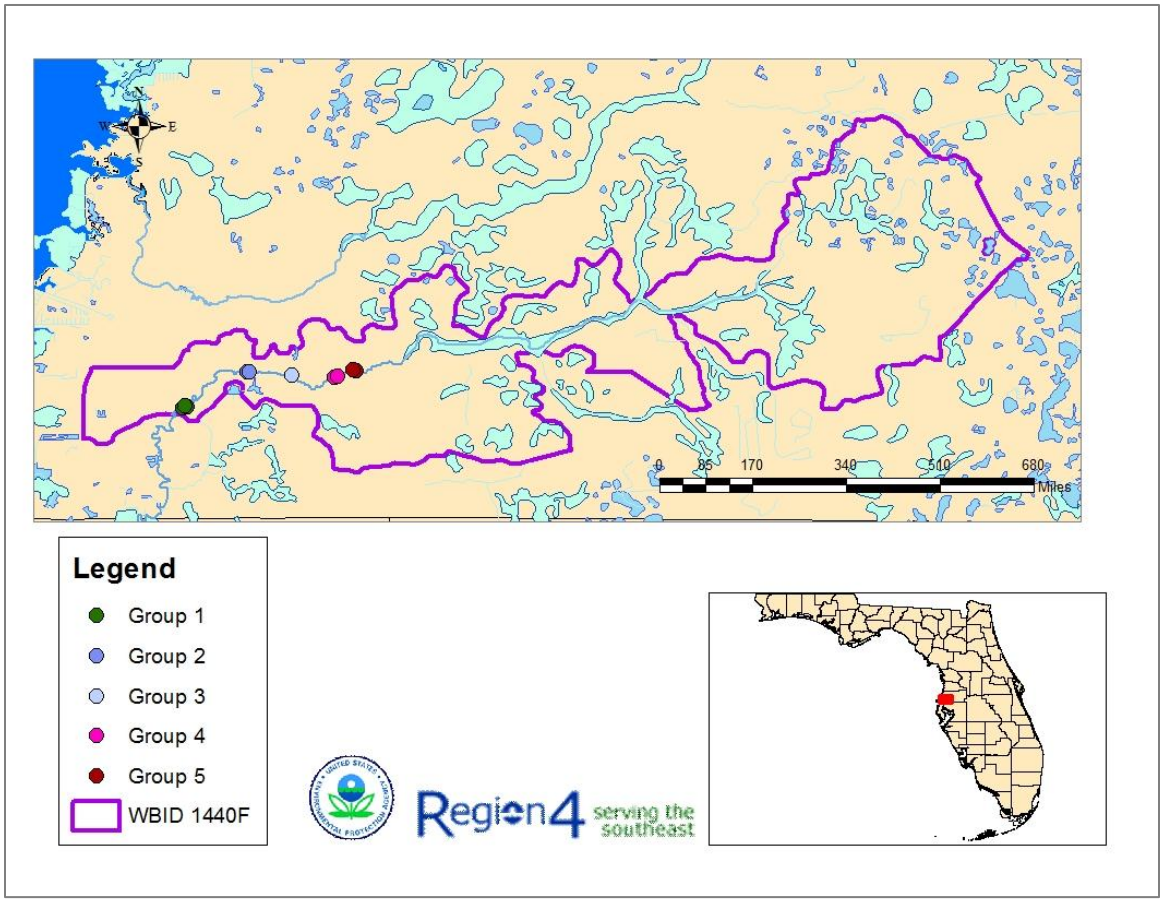

Figure 5 Location of Monitoring Station Groups within WBID 1440F Anclote River (Freshwater)

Fecal Coliform

Figure 6 provides a time series plot of fecal coliform data in Anclote River. There were 19 sampling locations used in the assessment that included a total of 131 observations, of which 34 (26%) fell above the water quality standard of 400 counts/100 ml fecal coliform. Several samples were flagged with laboratory remark codes. Appendix A provides the complete list of data results used in this TMDL analysis, along with laboratory remark codes, as applicable. Summary statistics for the fecal coliform data are provided in Table 4.

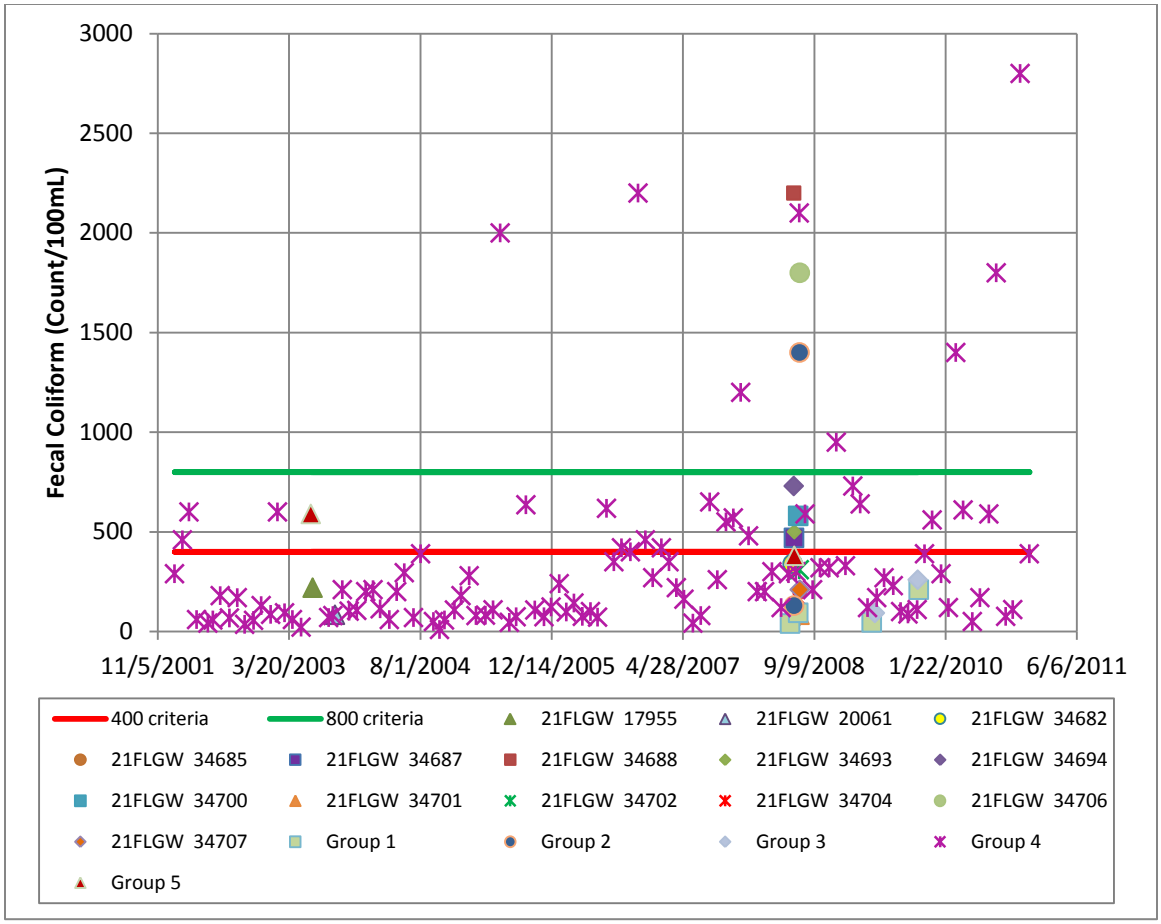

Figure 6 WBID 1440F: Anclote River (Freshwater) Measured Fecal Coliform

Table 4 Water Quality Statistics for Fecal Coliforms

Sampling Location	Minimum Concentration (#/100ml)	Maximum Concentration (#/100ml)	Mean Concentration (#/100ml)	Standard Deviation (#/100ml)	# Samples >400 (#/100ml)	# Samples >800 (#/100ml)
21FLGW 17955	220	220	220	NA[1]	0	0
21FLGW 20061	84	84	84	NA[1]	0	0
21FLGW 34682	340	340	340	NA[1]	0	0
21FLGW 34685	72	72	72	NA[1]	0	0
21FLGW 34687	470	470	470	NA[1]	1	0
21FLGW 34688	2200	2200	2200	NA[1]	1	1
21FLGW 34693	500	500	500	NA[1]	1	0
21FLGW 34694	730	730	730	NA[1]	1	0
21FLGW 34700	580	580	580	NA[1]	1	0
21FLGW 34701	84	84	84	NA[1]	0	0
21FLGW 34702	310	310	310	NA[1]	0	0
21FLGW 34704	160	160	160	NA[1]	0	0
21FLGW 34706	1800	1800	1800	NA[1]	1	1
21FLGW 34707	210	210	210	NA[1]	0	0
Group 1	40	210	98	79	0	0
Group 2	130	1400	765	898	1	1
Group 3	93	260	177	118	0	0
Group 4	10	2800	352	478	26	8
Group 5	380	590	485	148	1	0

[1]Note: Standard Deviation was not calculated because only one sample was collected at this sampling location.

Stream flow is an important factor affecting water quality, especially insofar as it determines the available loading capacity for pollutants. A load duration curve was developed for Anclote River, specifically WBID 1440F, in order to identify the environmental conditions under which the fecal coliform data was collected. Load duration curves display the relationship between stream flow and water quality, allowing the frequency and magnitude of water quality standard exceedances to be better understood. Load duration curves may also provide information about likely pollutant sources, since different types of sources tend to dominate under different flow conditions.

5.2. Flow Duration Curve

The first step in developing a load duration curve is to create a flow duration curve. A flow duration curve displays the cumulative frequency distribution of daily flow data over the period of record. Daily flow data collected at USGS 02310000 located within WBID 1440F was used to calculate the duration curve (Figure 7).

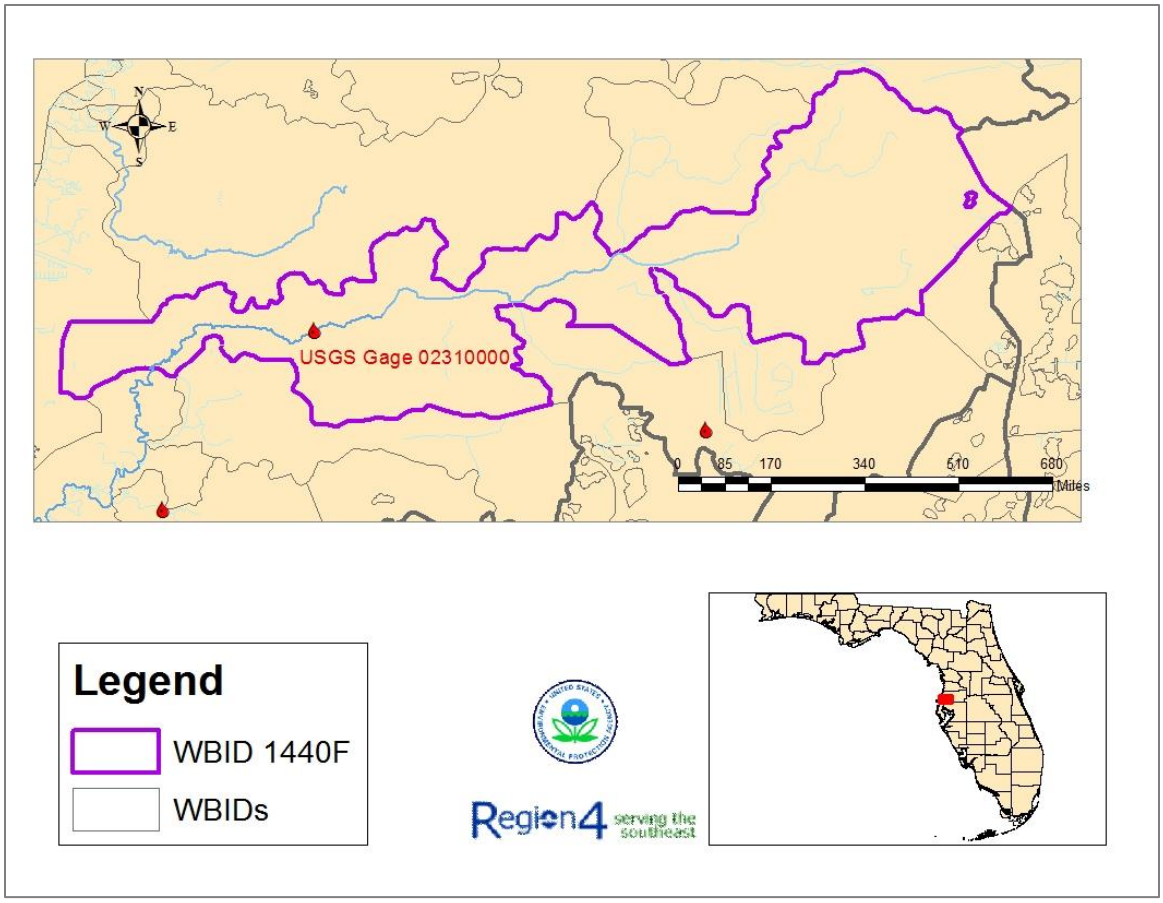

Figure 7 USGS Gage 02310000 Location

The flow duration curve relates the measured stream flow for a particular location on the stream to a duration interval representing the percent of time those measurements are equaled or exceeded. Values toward the right side of the plot represent low flow conditions that are surpassed with greater frequency. Values on the left side of the plot represent high flow conditions that occur less frequently. For example, a stream's discharge is expected to be equal to or greater than the flow corresponding to a duration interval of 30 approximately 30 percent of the time, and less than that value approximately 70 percent of the time. Duration curves are limited to the period of record available which for USGS Gage 02310000 is from 2002-2011. Using the flow data collected at USGS Gage 02310000 a flow duration curve for Anclote River was developed (Figure 8).

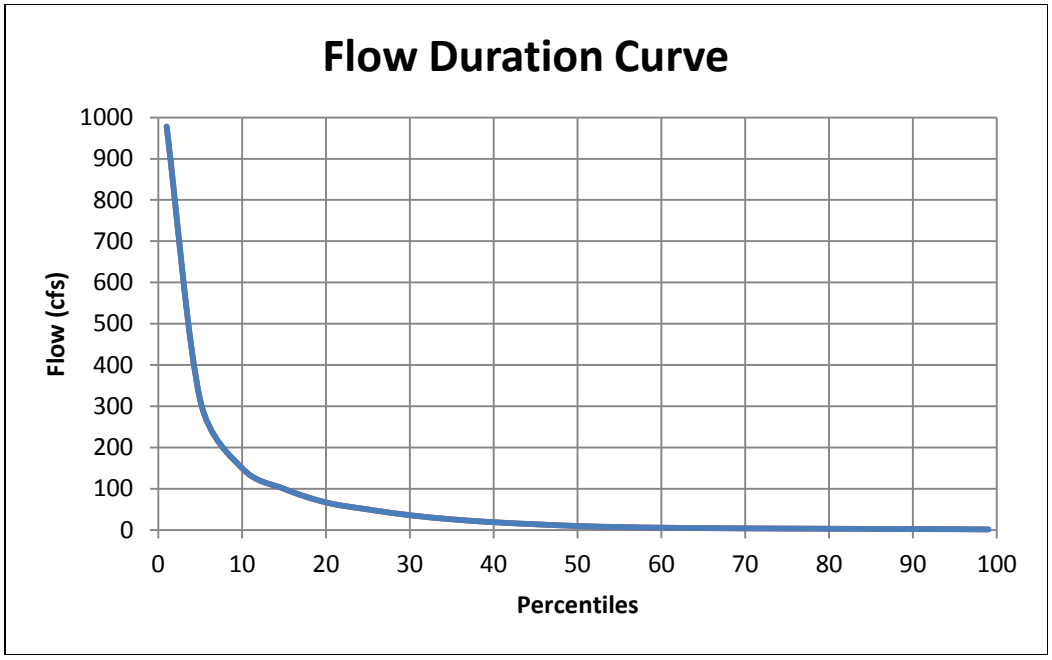

Figure 8 Flow Duration Curve for Anclote River from 2002-2011 data at USGS Gage 02310000

5.3. Load Duration Curve

The load duration curve is a visual display of the existing and allowable loads at each interval on the flow duration curve. Loads are calculated by multiplying the flow at each interval by a fecal coliform concentration and appropriate unit conversion factors.

$$Load = Concentration \times Flow \times ConversionFactor$$

Where:

Load = bacterial load in units of MPN/day
Flow = streamflow in units of cubic feet per second (cfs)
Concentration = existing or allowable concentration in units of MPN/100ml
Conversion Factor = (28.247 L/ft^3 * 86400 sec/day * 1000mL/L)/100ml

Existing loads are based on the instream coliform bacteria concentrations measured during ambient monitoring. Allowable loads are based on the applicable water quality criterion; either the daily "not to exceed" criterion of 800 count/100 ml, or the 400 count/100 ml criterion, which may be exceeded in up to 10 percent of the samples.

Duration curve intervals may be grouped into broad categories, or zones, in order to characterize the conditions and patterns associated with impairment (Cleland, 2003). Load duration curves are typically divided into five flow zones. The five flow zones are as follows: high flows (0-10% duration), moist conditions (10-40% duration), median or mid-range flows (40-60% duration), dry conditions (60-90% duration), and low flow (90-100% duration). Note that in using these intervals, the 25th percentile is the midpoint of the moist zone, the 50th percentile is the midpoint of the mid-range zone, and the 75th

percentile is the midpoint of the dry zone. The 5th and 95th percentiles are the midpoints of the high and low flow zones, respectively. Data falling into the high and low flow zones are frequently considered to represent extreme conditions.

Load duration curves for both components of the acute water quality criteria were constructed for Anclote River and compared with fecal coliform data collected at sample location Group 4 (Figure 9). Group 4 was selected because of its location relative to the gage and the quantity of data available at that location. The remaining sample locations were all sampled less than 4 times, with most only sampled once. In general, violations appearing on the right side of the curve occurred during low flow conditions and are indicative of either continuous, direct pollutant sources and/or sources that contaminate the stream's baseflow, such as leaking collection lines or septic systems. Violations that appear on the left side of the curve occurred during high flow events, indicating that pollutant delivery is likely driven by rainfall.

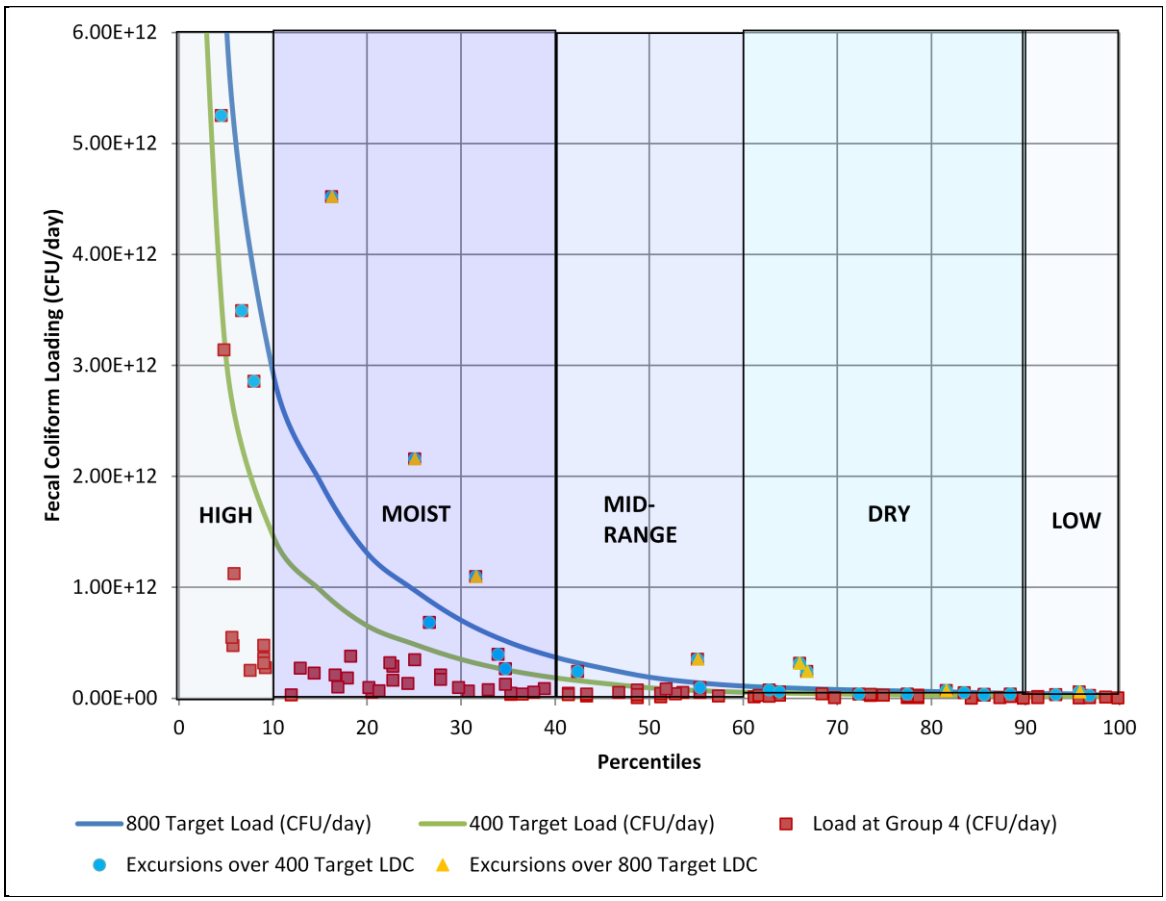

Figure 9 Load Duration Curve for Anclote River (WBID 1440F)

Figure 9 illustrates that the exceedances detected at sample location Group 4 does not appear to be dependent on any one type of flow condition. Exceedances of both the 400 and 800 criterion were detected in all five flow zones.

The load duration curve was only compared with water quality data collected at sampling location Group 4. There is not enough fecal coliform data from the remaining portions of the WBID to provide an accurate comparison. However, during June 2008 and July 2008 data was collected from several sample locations throughout the WBID within a span of one week. During the June 2008 sampling event (June 19th – 26th) the flow percentiles for the USGS gage 02310000 ranged from 95.5% - 97.7% indicating low flow conditions. Figure 10 plots the bacteria concentrations detected during that week with upstream to downstream concentrations depicted left to right.

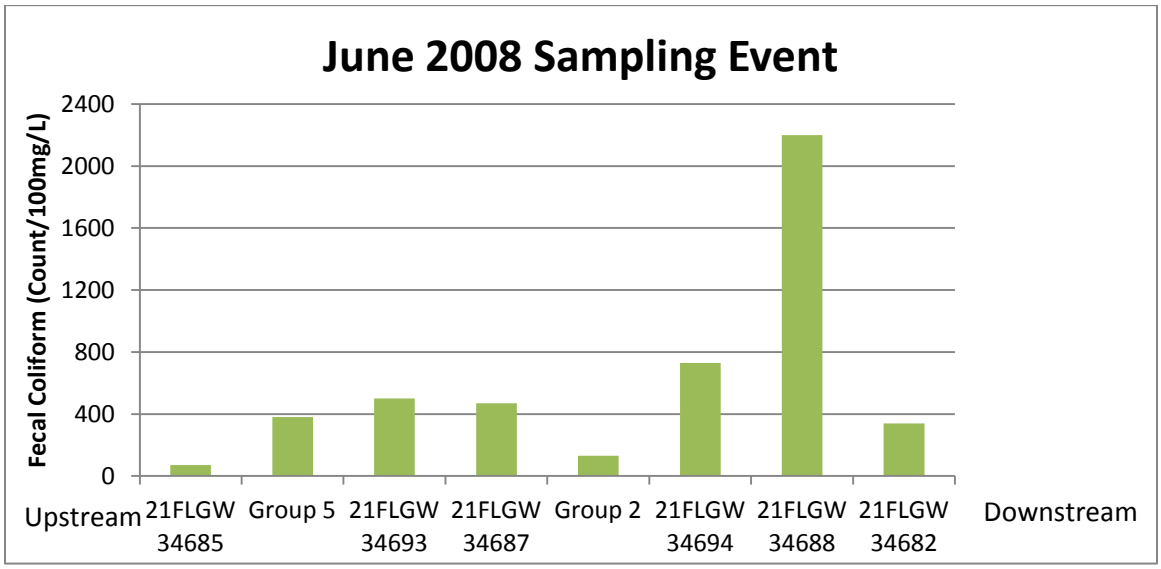

Figure 10 June 2008 Sampling Event in WBID 1440F, Anclote River (Freshwater)

During the July 2008 sampling event (July 10th – 16th) the flow percentiles for the USGS gage 02310000 ranged from 9.4-11.7% indicating high to moist flow conditions. Figure 11 plots the bacteria concentrations detected during that week with upstream to downstream concentrations depicted left to right.

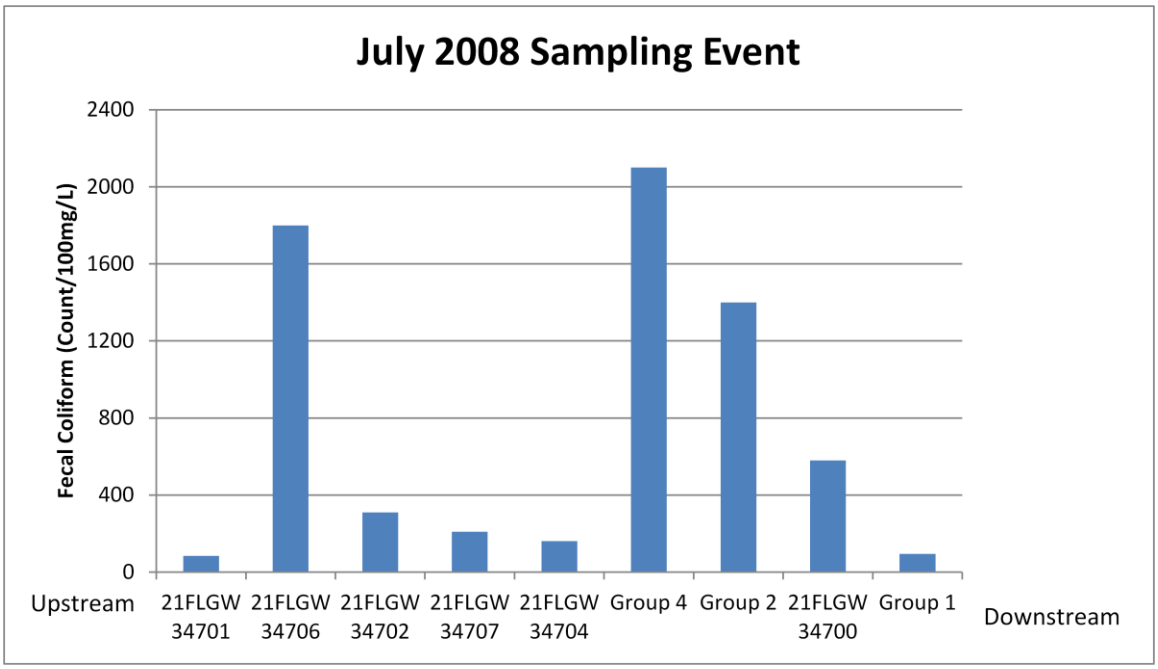

Figure 11 July 2008 Sampling Event in WBID 1440F, Anclote River (Freshwater)

Four samples collected during low flow conditions in June 2008 exceeded the 400 criteria and one sample exceeded the 800 criteria. Four samples collected during high flow conditions in July 2008 exceeded the 400 criteria and three samples exceeded the 800 criteria. Although the entire length of the stream was not sampled during these two events, these results provide additional support to the findings of the load duration curve comparison.

Based on the information presented in this section, exceedances were detected during all five flow zones; therefore, implementation of this TMDL should address control of point and nonpoint sources during both wet and dry weather conditions. More information pertaining to the potential point and nonpoint sources of fecal coliform bacteria to WBID 1440F is provided in the following sections.

6. Source and Load Assessment

An important part of the TMDL analysis is the identification of source categories, source subcategories, or individual sources of pollutants in the watershed and the amount of loading contributed by each of these sources. Sources are broadly classified as either point or nonpoint sources. Coliform bacteria can enter surface waters from both point and nonpoint sources.

6.1. Point Sources

A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source discharges of industrial wastewater and treated sanitary wastewater must be authorized by NPDES

permits. NPDES permitted discharges include continuous discharges such as wastewater treatment facilities as well as some stormwater driven sources such as MS4s, certain industrial facilities, and construction sites over one acre.

6.1.1. Wastewater/Industrial Permitted Facilities

There are no wastewater or industrial NPDES permitted facilities that discharge to or upstream of Anclote River, specifically WBID 1440F.

6.1.2. Stormwater Permitted Facilities/MS4s

The 1987 amendments to the Clean Water Act designated certain stormwater discharges as point sources requiring NPDES stormwater permits. The regulated activities involve MS4s, construction sites over one acre, and specific industrial operations. Although these types of stormwater discharges are now considered point sources with respect to permitting and TMDLs, they behave similarly to nonpoint sources in that they are driven by rainfall-runoff processes leading to the intermittent discharge of pollutants from land use activities in response to storms.

According to 40 CFR 122.26(b)(8), an MS4 is "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

> (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States;
>
> (ii) Designed or used for collecting or conveying storm water;
>
> (iii) Which is not a combined sewer; and
>
> (iv) Which is not part of a Publicly Owned Treatment Works."

MS4s may discharge coliform bacteria and other pollutants to waterbodies in response to storm events. In 1990, USEPA developed rules establishing Phase I of the NPDES stormwater program, designed to prevent harmful pollutants from being washed by stormwater runoff into MS4s (or from being dumped directly into the MS4) and then discharged from the MS4 into local waterbodies. Phase I of the program required operators of "medium" and "large" MS4s (those generally serving populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges from MS4s. Approved stormwater management programs for medium and large MS4s are required to address a variety of water quality related issues including roadway runoff management, municipal owned operations, hazardous waste treatment, etc.

Phase II of the rule extends coverage of the NPDES stormwater program to certain "small" MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES stormwater program. Only a select subset of small MS4s, referred to as "regulated small MS4s", requires an NPDES stormwater permit. Regulated small MS4s are defined as all small MS4s located in "urbanized areas" as defined by the Bureau of the Census, and those small MS4s located outside of "urbanized areas" that are designated by NPDES permitting authorities.

In October 2000, USEPA authorized FDEP to implement the NPDES stormwater program in all areas of Florida except Indian tribal lands. FDEP's authority to administer the NPDES program is set forth in Section 403.0885, Florida Statutes (FS). The three major components of NPDES stormwater regulations are:

- MS4 permits that are issued to entities that own and operate master stormwater systems, primarily local governments. Permittees are required to implement comprehensive stormwater management programs designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable.

- Stormwater associated with industrial activities, which is regulated primarily by a multisector general permit that covers various types of industrial facilities. Regulated industrial facilities must obtain NPDES stormwater permit coverage and implement appropriate pollution prevention techniques to reduce contamination of stormwater.

- Construction activity general permits for projects that ultimately disturb one or more acres of land and which require the implementation of stormwater pollution prevention plans to provide for erosion and sediment control during construction.

Anclote River, specifically WBID 1440F, lies within the Pasco County MS4 permitted service area (Permit No. FLS000032). Pasco County is a Phase I MS4 which consists of eight co-permittees representing cities, towns, and other public bodies located within the Pasco County area. The eastern portions of WBID 1440F lies within the city limits of New Port Richey, a co-permittee on the MS4 permit. A complete list of the co-permittees is provided in Appendix B.

Additionally, numerous facilities with minor Construction Stormwater Generic Permits are located within WBID 1440F; however, stormwater run-off from construction sites is not typically considered a significant source for coliform bacteria.

6.2. Non Point Sources

Nonpoint sources of coliform are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. These sources generally, but not always, involve accumulation of bacteria on land surfaces and wash off as a result of storm events. Typical nonpoint sources of coliform bacteria include:

- Wildlife
- Agricultural animals
- Onsite Sewer Treatment and Disposal Systems (septic tanks)
- Urban development (outside of Phase I or II MS4 permitted areas)

6.2.1. Wildlife

Wildlife contribute coliform bacteria by depositing feces onto land surfaces where it can be transported to nearby streams during storm events and by direct deposition to the waterbody by birds and other warm blooded animals. Bacteria originating from local wildlife are generally considered to represent natural background concentrations. In most impaired watersheds, the contribution from wildlife is small relative to the load from urban and agricultural areas. Approximately 18 percent of the land area within WBID 1440F is designated as forested and approximately 29 percent of the land area is designated as water or wetlands. The Jay B. Starkey Wilderness Park is located in the middle of WBID 1440F. This park is managed by Pasco County and offers hiking, biking and equestrian trails. Due to the high percentage of natural landuse, wildlife, particularly birds and water fowl, could be potential sources of bacteria to Anclote River, WBID 1440F.

6.2.2. Agriculture

Agriculture is a potential source of coliform delivery to streams, including runoff of manure from pastureland and cropland, and direct animal access to streams. Approximately 30% of the total land area within WBID 1440F is designated as agricultural. Approximately 95% of the agriculture lands are defined as cropland and/or pastureland.

The USDA National Agricultural Statistics Service (NASS) compiles Census of Agriculture data by county for virtually every facet of U.S. agriculture (USDA NASS, 2007). The "Census of Agriculture Act of 1997" (Title 7, United States Code, Section 2204g) directs the Secretary of Agriculture to conduct an agricultural census on a 5-year cycle, collecting data for the years ending in 2 and 7. According to 2007 Census of Agriculture data, there were 96 farms which fertilized approximately 2,463 acres with manure in Pasco County, Florida. A farm is defined as any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Livestock counts of cattle and pigs in Pasco County are provided in Table 5. Because agricultural census data are collected at the county level, the extent to which these values pertain to agricultural fields within the impaired watershed is not specified.

Table 5 2007 Agricultural Census Data for Livestock in Pasco County

County	Livestock	Number of Farms	Number of Animals
Pasco	Cattle and Calves	5	39
	Hogs and Pigs	28	210

Due to the percentage of agriculture lands in WBID 1440F, agriculture could be a potential source of bacteria to Anclote River, specifically WBID 1440F.

6.2.3. Onsite Sewerage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs), including septic tanks, are commonly used where providing sewer systems access is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, OSTDs can be a source of nutrients, pathogens, and other pollutants to both ground water and surface water.

The state of Florida Department of Health publishes data on new septic tank installations and the number of septic tank repair permits issued for each county in Florida. Table 6 summarizes the cumulative number of septic systems installed since the 1970 census and the total number of repair permits issued for years between 1991-92 and 2009-10. The data does not reflect septic tanks removed from service. Because these data are summarized at the county level, the extent to which these values pertain to the impaired watershed is not known.

Table 6 County Estimates of Septic Tanks and Repair Permits.

County	Number of Septic Tanks (1970- 2010)	Number of Repair Permits Issued (1991 – 2010)
Pasco	70,594	11,601

Note: Source: http://www.doh.state.fl.us/environment/ostds/statistics/ostdsstatistics.htm

The state of Florida Department of Health also maintains a list of OSTDs that have been inspected by the Florida Department of Health. The purpose for the inspections range from new installations to requested repair work. Figure 12 depicts the OSTDs inspection conducted in and adjacent to WBID 1440F, Anclote River (Freshwater). Without additional information, an explicit source cannot be determined. However, the presence of numerous OSTDs in the eastern and western portions of WBID 1440F suggests that OSTDs could be potential sources of pathogen loading to Anclote River.

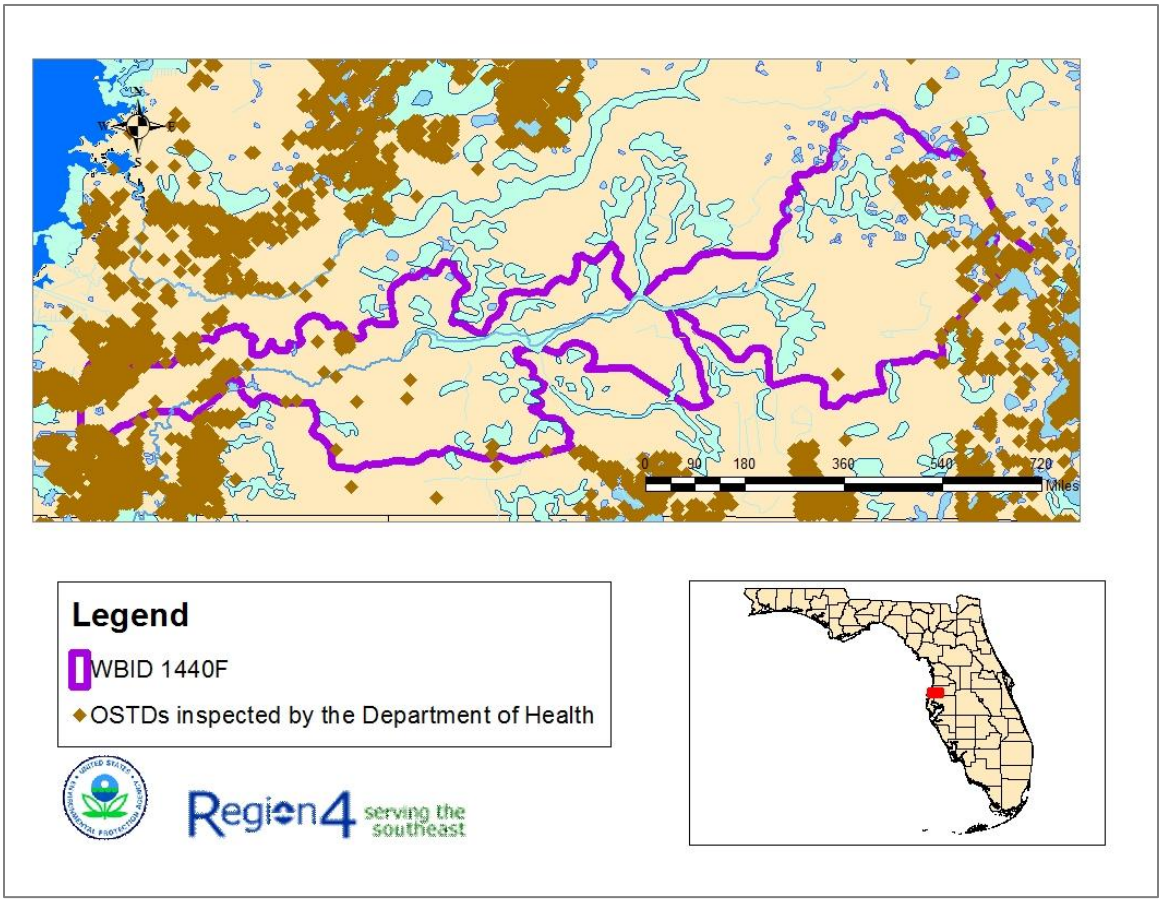

Figure 12 OSTDs inspected in the vicinity of Anclote River, WBID 1440F

6.2.4. Urban Areas/Pervious

Urban areas include land uses such as residential, industrial, utility swaths, extractive and commercial. Fecal coliform loading from urban areas (whether within an MS4 jurisdiction or not) is attributable to multiple sources including storm water runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals.

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as outlined in Chapter 403 FS, was established as a technology-based program that relies upon the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, FAC.

Florida's stormwater program is unique in having a performance standard for older stormwater systems that were built before the implementation of the Stormwater Rule in 1982. This rule states: "the pollutant loading from older stormwater management systems shall be reduced as needed to restore or maintain the beneficial uses of water" (Section 62-4-.432 (5)(c), FAC).

Nonstructural and structural BMPs are an integral part of the State's stormwater programs. Nonstructural BMPs, often referred to as "source controls," are those that can be used to prevent the generation of nonpoint source pollutants or to limit their transport off-site. Typical nonstructural BMPs include public education, land use management, preservation of wetlands and floodplains, and minimization of impervious surfaces. Technology-based structural BMPs are used to mitigate the increased stormwater peak discharge rate, volume, and pollutant loadings that accompany urbanization.

The area within the Anclote River watershed, specifically WBID 1440F, consists of approximately 20% urban landuse and is located within a permitted Phase I MS4. Additionally, several fecal coliform exceedances were detected within urbanized areas. As such, urban landuse could be a relevant source of pathogen loading to the Anclote River.

7. Analytical Approach

The approach for calculating fecal coliform TMDLs depends on the number of water quality samples and the availability of flow data. When long-term records of water quality and flow data are not available, the TMDL is expressed as a percent reduction. Load duration curves are used to develop TMDLs when significant data are available to develop a relationship between flow and concentration. Although flow data is available for Anclote River, long-term records of water quality is not available throughout the WBID; therefore, this TMDL is expressed as a percent reduction.

This TMDL report was proposed for public comment on March 20, 2012. During the public response period, Pasco County submitted 40 additional fecal coliform sample results collected by the county between February 2002 and February 2012. These samples were collected at a station along Anclote River at Seven Springs Boulevard. According the Pasco County, the county's Standard Operation Procedures for water quality monitoring are fully compliant with the requirements of the Florida Department of Environmental Protection. EPA contacted FDEP regarding the additional data. FDEP has not evaluated the data; however, they were not aware of any reason the data would be considered invalid. Therefore, the additional data was included in the TMDL calculation. A location map, along with a table of the results provided by Pasco County, is provided in Appendix C. Please note one of the samples submitted did not have a numeral value and was therefore not included in the TMDL analysis.

7.1. Percent Reduction Approach for TMDL Development

Under this "percent reduction" method, the percent reduction needed to meet the applicable criterion is calculated based on a percentile of all measured concentrations. The (p X 100) percentile is the value with the cumulative probability of p. For example, the 90^{th} percentile has a cumulative probability of 0.90. The 90^{th} percentile is also called the 10 percent exceedance event because it will be exceeded with the probability of 0.10. Therefore, considering a set of water quality data, 90 percent of the measured values are lower than the 90^{th} percentile concentration and 10 percent are higher. There are many formulas for determining the percentile and these can be found in many text books on

statistics. The Hazen formula was used in this TMDL since it is recommended in Hunter's Applied Microbiology (2002) article concerning bacteria in water. Application of the Hazen formula to data collected in WBID 1440F is provided in Appendix C

Location map and data results submitted by Pasco County

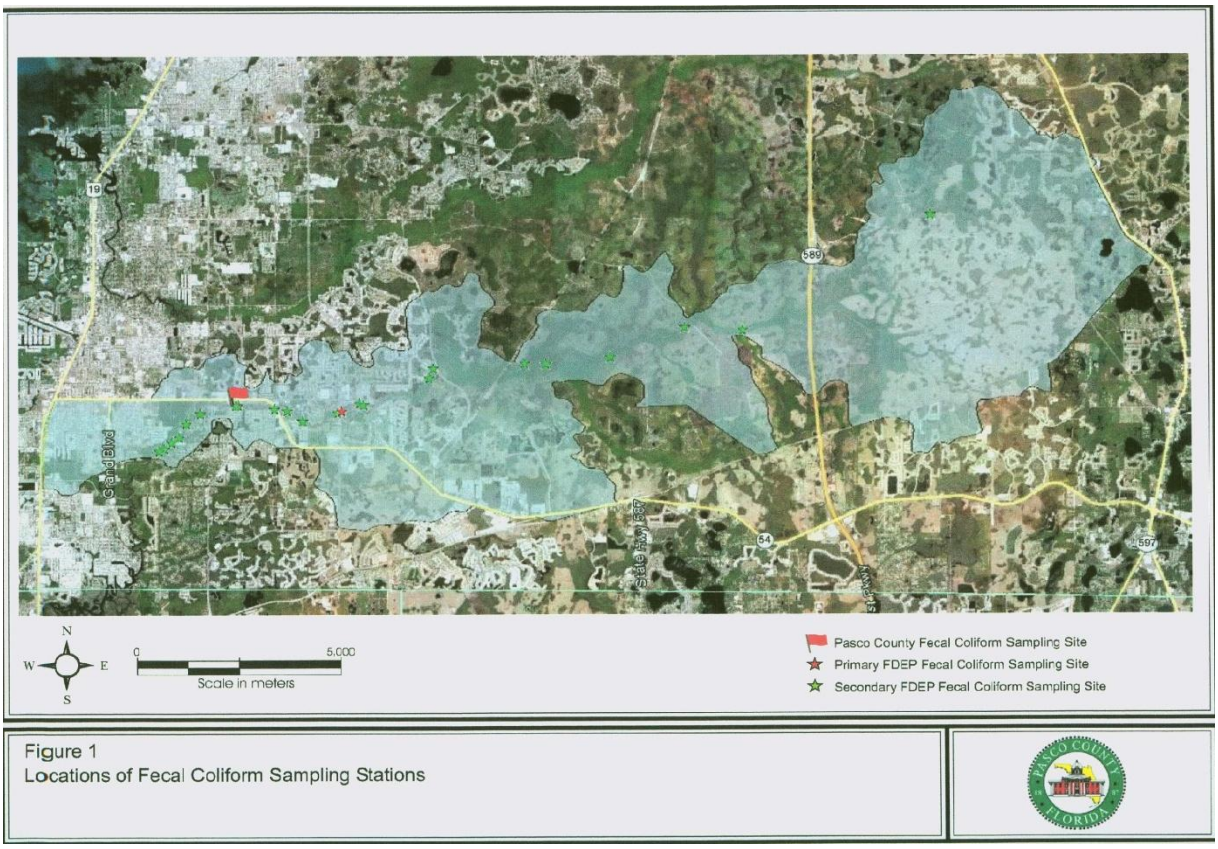

Figure 1
Locations of Fecal Coliform Sampling Stations

Table 1. Supplemental fecal coliform data for the Anclote River (WBID 1440F) collected at Seven Springs Boulevard in Pasco County

Date	Result	Remark Code
2/7/2002	900	
5/1/2002	300	
8/28/2002	TNTC	
11/14/2002	70	
3/11/2003	51	
6/26/2003	40	
11/11/2003	60	
11/29/2005	190	
2/15/2006	210	
5/10/2006	200	
8/29/2006	320	
11/14/2006	240	
2/7/2007	330	
5/31/2007	150	
9/26/2007	60	
12/18/2007	180	
3/27/2008	150	
7/22/2008	48	
11/12/2008	830	
1/27/2009	370	
4/27/2009	140	
7/23/2009	180	
11/4/2009	85	
2/3/2010	240	
5/6/2010	180	B
8/4/2010	230	
11/3/2010	200	B
1/12/2011	140	
2/8/2011	320	
3/7/2011	290	
4/8/2011	170	B
6/8/2011	190	B
7/11/2011	200	
8/15/2011	10	U
9/18/2011	320	
10/19/2011	220	
11/15/2011	27	B
12/13/2011	160	B
1/31/2012	440	
2/24/2012	280	

U = Analyte was undetected. Indicated concentration is the method detection limit (MDL).
B = Results based on colony counts outside the method indicated ideal range.
TNTC: too numerous to count

Appendix .

The TMDL percent reduction required to meet the coliform criteria is based on the following equation:

$$\%\text{Reduction} = \left(\frac{[existing] - [criterion]}{[existing]} \right) \times 100$$

Where:

% Reduction = percent reduction
[*existing*] = existing concentration
[*criterion*] = criterion concentration (i.e. target)

8. TMDL Determination

A TMDL for a given pollutant and waterbody is comprised of the sum of individual waste load allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is represented by the equation:

$$\text{TMDL} = \sum\text{WLAs} + \sum\text{LAs} + \text{MOS}$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody and still achieve water quality standards and the waterbody's designated use. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be set and thereby provide the basis to establish water quality-based controls.

The percent reduction that meets the acute criteria for Class III waters was calculated by comparing the 90th percentile value with the 400 counts/100 ml criterion. The calculated TMDL reduction for Anclote River (WBID 1440F) is summarized in Table 7.

Table 7 Summary of TMDL Components.

Waterbody	WBID	WLA[1]		LA	TMDL
		Facility (MPN/day)	Stormwater/MS4 (% Reduction)[2]	(% Reduction)[2]	(% Reduction)[2]
Anclote River (Freshwater)	1440F	N/A	38%	38%	38%

Notes:

1. The WLA is typically separated into the components originating from continuous wastewater NPDES facilities (e.g. WWTPs) and from stormwater NPDES permitted facilities/public bodies (e.g. MS4s).
2. Overall percent reduction required to achieve the 400 counts/100 ml fecal coliform criterion. The

MOS is implicit and does not take away from the TMDL value.

The TMDL is expressed as a daily load by multiplying the water quality target by an estimate of flow in the WBID. The maximum load the stream can transport on any one day and maintain water quality standards is calculated by multiplying 800 counts/100 ml by the flow (in cubic feet per second), along with a conversion factor to obtain units of fecal coliform counts per day.

8.1. Critical Conditions and Seasonal Variation

The critical conditions can be defined as the environmental conditions requiring the largest reduction to meet standards. By achieving the reduction for critical conditions, water quality standards should be achieved during all other times. Seasonal variation must also be considered in TMDL development to ensure that water quality standards will be met during all seasons of the year.

The critical condition for nonpoint source coliform loading is typically an extended dry period followed by a rainfall-runoff event. During dry weather periods, coliforms build up on the land surface, and are washed off by subsequent rainfall. The critical condition for point source loading usually occurs during periods of low streamflow when dilution is minimized.

Load duration curves for both components of the acute water quality criteria were constructed for Anclote River and compared with fecal coliform data collected at sample location Group 4. In order to characterize the conditions and patterns associated with impairment, the duration curve intervals were divided into five flow zones; high flows, moist conditions, mid-range flows, dry conditions, and low flows. Based on this analysis, exceedances were detected at sample location Group 4 during all five flow zones. Additionally data collected from various sample locations during both low flow and high flow conditions were also compared. Exceedances were detected during both conditions at various locations throughout the stream. Therefore, critical conditions and seasonal variation are accounted for in the TMDL analysis for Anclote River by selecting the largest percent reduction from the entire period of measured water quality data, and using it to represent the pollutant reduction required year-round, for the entire watershed.

8.2. Existing Conditions

Existing conditions represent the current water quality conditions of a waterbody. Existing conditions for WBID 1440F are being represented using the 90^{th} percentile of measured concentrations. The 90^{th} percentile and percent reduction required to meet the TMDL target are shown below in Table 8.

Table 8 Fecal Coliform Existing Conditions in Anclote River (WBID 1440F).

90th Percentile Fecal Coliform Concentration	Percent Reduction to meet TMDL Target
640	38 percent

Several samples were flagged with laboratory remark codes. The following laboratory remark codes were associated with at least one of the samples analyzed as part of this TMDL.

Remark Code A – The laboratory remark code A indicates that the result value reported is the mean of two or more samples. However, the values were considered to be accurate and are acceptable for use in the TMDL analysis.

Remark Code B –The laboratory remark code B indicates that the sample result was based upon colony counts outside of the acceptable range. However, the colony counts were considered to be an accurate count and are acceptable for use in the TMDL analysis.

Remark Code Q – The laboratory remark code Q indicates that the sample was held beyond normal holding time. However, holding samples on ice slows the metabolism of the organisms resulting in no appreciable growth. Actual concentration is expected to be at least as high as the value reported. Therefore, the data was considered acceptable for use in the TMDL analysis.

Remark Code U – The laboratory remark code U indicates that the sample was analyzed but fecal coliform concentrations were not detected. The value stored is the limit of detection. Because the record value is 40 times lower than the WQ criteria and does not increase the calculated percent reduction, the data was considered acceptable for use in the TMDL analysis.

Appendix A provides the complete list of data results used in this TMDL analysis obtained from the IWR database, along with laboratory remark codes, as applicable. Appendix C provides the complete list of data results obtained from Pasco County, along with laboratory remark codes, as applicable.

8.3. Margin of Safety

There are two methods for incorporating an MOS in the analysis: a) implicitly incorporate the MOS using conservative assumptions to develop TMDL allocations; or b) explicitly reserve a portion of the TMDL as the MOS and use the remainder for point and nonpoint source allocations. An implicit MOS was incorporated into the TMDL approach by including natural sources of fecal coliform bacteria in the calculation of existing conditions. This conservatively estimates the anthropogenic contributions and increases the required reduction for the TMDL.

8.4. Waste Load Allocations

Only MS4s and NPDES facilities discharging directly into water segments (or upstream tributaries of those segments) are assigned a WLA. The WLAs, if applicable, are

expressed separately for continuous discharge facilities (e.g., WWTPs) and MS4 areas, as the former discharges during all weather conditions, whereas the later discharges in response to storm events.

8.4.1. Wastewater/Industrial Permitted Facilities

There are no wastewater or industrial NPDES permitted facilities that discharge to Anclote River, specifically WBID 1440F.

8.4.2. Stormwater Permitted Facilities/MS4s

The WLA for stormwater permitted facilities/MS4s are expressed in terms of percent reductions equivalent to the reductions required for nonpoint sources. Given the available data, it is not possible to estimate loadings coming exclusively from the stormwater permitted facilities and/or MS4 areas. Although the aggregate wasteload allocations for stormwater discharges are expressed in numeric form, i.e. percent reduction, based on the information available today, it is infeasible to calculate numeric WLAs for individual stormwater outfalls because discharges from these sources can be highly intermittent, are usually characterized by very high flows occurring over relatively short time intervals, and carry a variety of pollutants whose nature and extent varies according to geography and local land use. For example, municipal sources often include numerous individual outfalls spread over large areas. Water quality impacts, in turn, also depend on a wide range of factors, including the magnitude and duration of rainfall events, the time period between events, soil conditions, fraction of land that is impervious to rainfall, other land use activities, and the ratio of stormwater discharge to receiving water flow.

This TMDL assumes, for the reasons stated above, that it is infeasible to calculate numeric water quality-based effluent limitations for stormwater discharges. Therefore, in the absence of information presented to the permitting authority showing otherwise, this TMDL assumes that water quality-based effluent limitations for stormwater sources of nutrients derived from this TMDL can be expressed in narrative form (e.g., as best management practices), provided that: (1) the permitting authority explains in the permit fact sheet the reasons it expects the chosen BMPs to achieve the aggregate wasteload allocation for these stormwater discharges; and (2) the state will perform ambient water quality monitoring for the purpose of determining whether the BMPs in fact are achieving such aggregate wasteload allocation.

Anclote River, specifically WBID 1440F, lies within the Pasco County MS4 permitted service area (Permit No. FLS000032). Pasco County is a Phase I MS4 which consists of eight co-permittees representing cities, towns, and other public bodies located within the Pasco County area. The eastern portion of WBID 1440F lies within the city of New Port Richey, a co-permittee on the MS4 permit. A complete list of the co-permittees is provided in Appendix B.

Additionally, numerous facilities with minor Construction Stormwater Generic Permits are located within WBID 1440F; however, stormwater run-off from construction sites is

not typically considered a significant source for coliform bacteria and were not included in the WLA.

8.5. Load Allocations

The load allocation for nonpoint sources was assigned a percent reduction from the current loadings coming into Anclote River.

9. Recommendations

The initial step in implementing a pathogen TMDL is to more specifically locate the source(s) of bacteria in the watershed. FDEP employs the Basin Management Action Plan (B-MAP) as the mechanism for developing strategies to accomplish the specified load reductions. Components of a B-MAP are:

- Allocations among stakeholders
- Listing of specific activities to achieve reductions
- Project initiation and completion timeliness
- Identification of funding opportunities
- Agreements
- Local ordinances
- Local water quality standards and permits
- Follow-up monitoring

10. References

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FDEP 2008. *Water Quality Assessment Report: Springs Coast.* Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Southwest District, Group 5 Basin. 2008.

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Florida Administrative Code. Chapter 62-303, Identification of Impaired Surface Waters.

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USEPA, 1991. *Guidance for Water Quality –based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.

Appendix A

Fecal Coliform Measurements in Anclote River, Freshwater (WBID 1440F)

Date	Time	Station	Fecal Coliform (count/100mL)	Remark Code
6/18/2003	1200	21FLGW 17955	220	Q
6/11/2003	915	21FLGW 17963	590	Q
9/11/2003	1300	21FLGW 20061	84	Q
6/25/2008	1200	21FLGW 34680	380	Q
6/19/2008	1045	21FLGW 34682	340	Q
6/24/2008	930	21FLGW 34684	130	B
6/26/2008	1015	21FLGW 34685	72	A
6/24/2008	1245	21FLGW 34687	470	Q
6/23/2008	1030	21FLGW 34688	2200	Q
6/9/2008	1320	21FLGW 34689	40	Q
6/25/2008	1000	21FLGW 34693	500	Q
6/23/2008	1200	21FLGW 34694	730	B
7/10/2008	1200	21FLGW 34698	94	Q
7/14/2008	1015	21FLGW 34699	2100	Q
7/10/2008	1015	21FLGW 34700	580	Q
7/15/2008	1000	21FLGW 34701	84	A
7/14/2008	1430	21FLGW 34702	310	Q
7/15/2008	1200	21FLGW 34703	1400	B
7/16/2008	1030	21FLGW 34704	160	B
7/16/2008	1230	21FLGW 34706	1800	B
7/16/2008	1300	21FLGW 34707	210	Q
1/8/2002	1030	21FLGW 3509	290	Q
2/7/2002	930	21FLGW 3509	460	Q
3/4/2002	915	21FLGW 3509	600	Q
4/2/2002	845	21FLGW 3509	60	Q
5/15/2002	845	21FLGW 3509	42	Q
6/3/2002	945	21FLGW 3509	58	Q
7/1/2002	1000	21FLGW 3509	180	Q
8/5/2002	945	21FLGW 3509	68	Q
9/4/2002	915	21FLGW 3509	170	Q
10/2/2002	900	21FLGW 3509	36	Q
11/5/2002	930	21FLGW 3509	56	Q
12/4/2002	930	21FLGW 3509	130	Q
1/9/2003	1435	21FLGW 3509	86	Q
2/4/2003	1600	21FLGW 3509	600	Q
3/3/2003	935	21FLGW 3509	94	Q
4/2/2003	920	21FLGW 3509	60	Q
5/5/2003	1545	21FLGW 3509	22	Q
8/18/2003	930	21FLGW 3509	70	Q
9/3/2003	930	21FLGW 3509	80	Q
10/9/2003	930	21FLGW 3509	210	Q

Date	Time	Station	Fecal Coliform (count/100mL)	Remark Code
11/4/2003	900	21FLGW 3509	102	Q
12/3/2003	945	21FLGW 3509	106	Q
1/6/2004	850	21FLGW 3509	200	Q
2/3/2004	1400	21FLGW 3509	210	Q
3/1/2004	915	21FLGW 3509	114	Q
4/5/2004	1430	21FLGW 3509	60	Q
5/3/2004	1545	21FLGW 3509	200	Q
6/1/2004	845	21FLGW 3509	295	A
7/6/2004	1400	21FLGW 3509	70	Q
8/2/2004	900	21FLGW 3509	390	Q
9/20/2004	1315	21FLGW 3509	50	Q
10/13/2004	1400	21FLGW 3509	10	B
11/1/2004	1500	21FLGW 3509	58	Q
12/9/2004	840	21FLGW 3509	108	Q
1/3/2005	910	21FLGW 3509	180	B
2/3/2005	900	21FLGW 3509	280	Q
3/1/2005	930	21FLGW 3509	80	Q
4/6/2005	915	21FLGW 3509	82	Q
5/5/2005	1245	21FLGW 3509	109	A
6/1/2005	930	21FLGW 3509	2000	Q
7/6/2005	940	21FLGW 3509	46	Q
8/1/2005	1410	21FLGW 3509	74	Q
9/7/2005	900	21FLGW 3509	636	B
10/11/2005	900	21FLGW 3509	108	Q
11/15/2005	1200	21FLGW 3509	74	Q
12/12/2005	1000	21FLGW 3509	123	A
1/12/2006	1230	21FLGW 3509	240	Q
2/8/2006	845	21FLGW 3509	98	Q
3/9/2006	910	21FLGW 3509	143	B
4/10/2006	1600	21FLGW 3509	76	A
5/11/2006	1515	21FLGW 3509	100	Q
6/7/2006	900	21FLGW 3509	72	Q
7/11/2006	900	21FLGW 3509	618	B
8/8/2006	1000	21FLGW 3509	350	Q
9/6/2006	815	21FLGW 3509	420	Q
10/10/2006	830	21FLGW 3509	400	Q
11/8/2006	900	21FLGW 3509	2200	Q
12/6/2006	930	21FLGW 3509	460	Q
1/3/2007	830	21FLGW 3509	270	Q
2/5/2007	915	21FLGW 3509	420	Q
3/6/2007	945	21FLGW 3509	350	Q
4/3/2007	900	21FLGW 3509	220	Q
5/2/2007	900	21FLGW 3509	162	B
6/5/2007	930	21FLGW 3509	42	Q
7/5/2007	900	21FLGW 3509	80	Q
8/8/2007	900	21FLGW 3509	650	B

Date	Time	Station	Fecal Coliform (count/100mL)	Remark Code
9/6/2007	830	21FLGW 3509	260	Q
10/9/2007	930	21FLGW 3509	550	Q
11/6/2007	845	21FLGW 3509	570	Q
12/4/2007	900	21FLGW 3509	1200	B
1/3/2008	930	21FLGW 3509	480	Q
2/5/2008	900	21FLGW 3509	200	Q
3/4/2008	900	21FLGW 3509	200	Q
4/1/2008	915	21FLGW 3509	300	Q
5/6/2008	845	21FLGW 3509	120	Q
6/3/2008	900	21FLGW 3509	290	Q
7/1/2008	850	21FLGW 3509	300	Q
8/5/2008	845	21FLGW 3509	590	Q
9/3/2008	845	21FLGW 3509	210	Q
10/1/2008	845	21FLGW 3509	320	Q
11/5/2008	900	21FLGW 3509	320	Q
12/2/2008	900	21FLGW 3509	950	B
1/6/2009	900	21FLGW 3509	330	Q
2/3/2009	915	21FLGW 3509	730	B
3/3/2009	845	21FLGW 3509	640	B
3/31/2009	900	21FLGW 3509	120	Q
5/5/2009	900	21FLGW 3509	170	B
6/2/2009	845	21FLGW 3509	270	Q
7/7/2009	900	21FLGW 3509	230	Q
8/4/2009	830	21FLGW 3509	100	Q
9/1/2009	845	21FLGW 3509	88	Q
10/6/2009	850	21FLGW 3509	110	Q
11/3/2009	850	21FLGW 3509	390	Q
12/2/2009	840	21FLGW 3509	560	Q
1/5/2010	845	21FLGW 3509	290	Q
2/2/2010	845	21FLGW 3509	120	A
3/2/2010	830	21FLGW 3509	1400	B
3/30/2010	845	21FLGW 3509	610	B
5/4/2010	830	21FLGW 3509	50	Q
6/2/2010	815	21FLGW 3509	170	B
7/6/2010	830	21FLGW 3509	590	Q
8/3/2010	830	21FLGW 3509	1800	B
9/8/2010	830	21FLGW 3509	76	Q
10/5/2010	845	21FLGW 3509	110	Q
11/2/2010	840	21FLGW 3509	2800	B
12/7/2010	930	21FLGW 3509	390	Q
4/16/2009	1030	21FLGW 37001	46	Q
4/28/2009	925	21FLGW 37006	93	A
10/12/2009	1030	21FLGW 37942	210	Q
10/8/2009	1000	21FLGW 37947	260	Q

Appendix B

List Co-Permittees for the Pasco County MS4 permit (FLS000032)

County	Permit/Co-permit Name	Permit ID Number	MS4 Type
Pasco	City of Dade City	FLS000032	Phase I
Pasco	City of New Port Richey	FLS000032	Phase I
Pasco	City of Port Richey	FLS000032	Phase I
Pasco	City of San Antonio	FLS000032	Phase I
Pasco	Town of St. Leo	FLS000032	Phase I
Pasco	City of Zephyrhills	FLS000032	Phase I
Pasco	FDOT District 7	FLS000032	Phase I
Pasco	Pasco County	FLS000032	Phase I

Appendix C

Location map and data results submitted by Pasco County

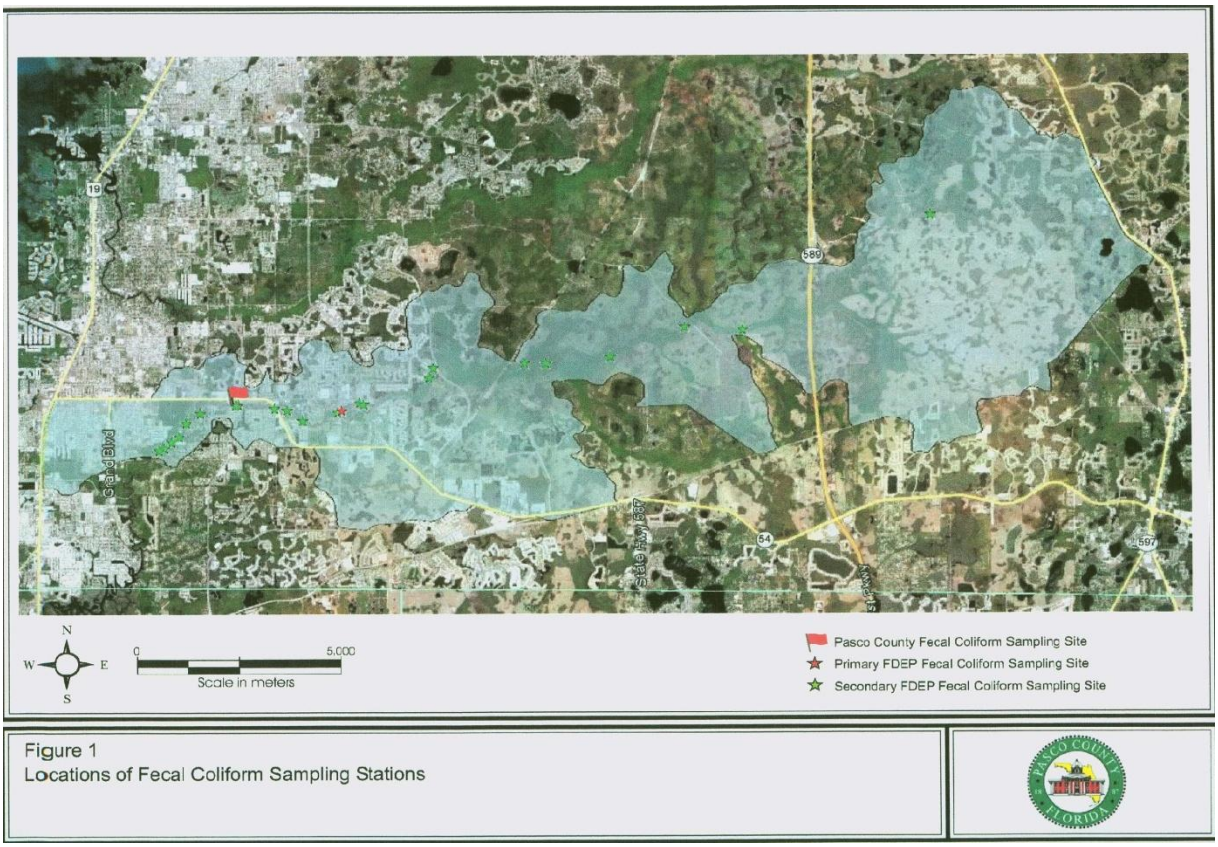

Figure 1
Locations of Fecal Coliform Sampling Stations

Table 1. Supplemental fecal coliform data for the Anclote River (WBID 1440F) collected at Seven Springs Boulevard in Pasco County

Date	Result	Remark Code
2/7/2002	900	
5/1/2002	300	
8/28/2002	TNTC	
11/14/2002	70	
3/11/2003	51	
6/26/2003	40	
11/11/2003	60	
11/29/2005	190	
2/15/2006	210	
5/10/2006	200	
8/29/2006	320	
11/14/2006	240	
2/7/2007	330	
5/31/2007	150	
9/26/2007	60	
12/18/2007	180	
3/27/2008	150	
7/22/2008	48	
11/12/2008	830	
1/27/2009	370	
4/27/2009	140	
7/23/2009	180	
11/4/2009	85	
2/3/2010	240	
5/6/2010	180	B
8/4/2010	230	
11/3/2010	200	B
1/12/2011	140	
2/8/2011	320	
3/7/2011	290	
4/8/2011	170	B
6/8/2011	190	B
7/11/2011	200	
8/15/2011	10	U
9/18/2011	320	
10/19/2011	220	
11/15/2011	27	B
12/13/2011	160	B
1/31/2012	440	
2/24/2012	280	

U = Analyte was undetected. Indicated concentration is the method detection limit (MDL).
B = Results based on colony counts outside the method indicated ideal range.
TNTC: too numerous to count

Appendix D

Fecal Coliform Data and Percentiles for WBID 1440F

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
10/13/2004	21FLGW 3509	10	1	0%
8/15/2011	Pasco County data	10	1	0%
5/5/2003	21FLGW 3509	22	3	1%
11/15/2011	Pasco County data	27	4	2%
10/2/2002	21FLGW 3509	36	5	3%
6/9/2008	21FLGW 34689	40	6	3%
6/26/2003	Pasco County data	40	6	3%
5/15/2002	21FLGW 3509	42	8	4%
6/5/2007	21FLGW 3509	42	8	4%
7/6/2005	21FLGW 3509	46	10	6%
4/16/2009	21FLGW 37001	46	10	6%
7/22/2008	Pasco County data	48	12	7%
9/20/2004	21FLGW 3509	50	13	7%
5/4/2010	21FLGW 3509	50	13	7%
3/11/2003	Pasco County data	51	15	9%
11/5/2002	21FLGW 3509	56	16	9%
6/3/2002	21FLGW 3509	58	17	10%
11/1/2004	21FLGW 3509	58	17	10%
4/2/2002	21FLGW 3509	60	19	11%
4/2/2003	21FLGW 3509	60	19	11%
4/5/2004	21FLGW 3509	60	19	11%
11/11/2003	Pasco County data	60	19	11%
9/26/2007	Pasco County data	60	19	11%
8/5/2002	21FLGW 3509	68	24	14%
8/18/2003	21FLGW 3509	70	25	14%
7/6/2004	21FLGW 3509	70	25	14%
11/14/2002	Pasco County data	70	25	14%
6/26/2008	21FLGW 34685	72	28	16%
6/7/2006	21FLGW 3509	72	28	16%
8/1/2005	21FLGW 3509	74	30	17%
11/15/2005	21FLGW 3509	74	30	17%
4/10/2006	21FLGW 3509	76	32	19%
9/8/2010	21FLGW 3509	76	32	19%
9/3/2003	21FLGW 3509	80	34	20%
3/1/2005	21FLGW 3509	80	34	20%
7/5/2007	21FLGW 3509	80	34	20%
4/6/2005	21FLGW 3509	82	37	21%
9/11/2003	21FLGW 20061	84	38	22%
7/15/2008	21FLGW 34701	84	38	22%
11/4/2009	Pasco County data	85	40	23%
1/9/2003	21FLGW 3509	86	41	24%

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
9/1/2009	21FLGW 3509	88	42	24%
4/28/2009	21FLGW 37006	93	43	25%
7/10/2008	21FLGW 34698	94	44	26%
3/3/2003	21FLGW 3509	94	44	26%
2/8/2006	21FLGW 3509	98	46	27%
5/11/2006	21FLGW 3509	100	47	27%
8/4/2009	21FLGW 3509	100	47	27%
11/4/2003	21FLGW 3509	102	49	29%
12/3/2003	21FLGW 3509	106	50	29%
12/9/2004	21FLGW 3509	108	51	30%
10/11/2005	21FLGW 3509	108	51	30%
5/5/2005	21FLGW 3509	109	53	31%
10/6/2009	21FLGW 3509	110	54	31%
10/5/2010	21FLGW 3509	110	54	31%
3/1/2004	21FLGW 3509	114	56	33%
5/6/2008	21FLGW 3509	120	57	33%
3/31/2009	21FLGW 3509	120	57	33%
2/2/2010	21FLGW 3509	120	57	33%
12/12/2005	21FLGW 3509	123	60	35%
6/24/2008	21FLGW 34684	130	61	36%
12/4/2002	21FLGW 3509	130	61	36%
4/27/2009	Pasco County data	140	63	37%
1/12/2011	Pasco County data	140	63	37%
3/9/2006	21FLGW 3509	143	65	38%
5/31/2007	Pasco County data	150	66	39%
3/27/2008	Pasco County data	150	66	39%
7/16/2008	21FLGW 34704	160	68	40%
12/13/2011	Pasco County data	160	68	40%
5/2/2007	21FLGW 3509	162	70	41%
9/4/2002	21FLGW 3509	170	71	41%
5/5/2009	21FLGW 3509	170	71	41%
6/2/2010	21FLGW 3509	170	71	41%
4/8/2011	Pasco County data	170	71	41%
7/1/2002	21FLGW 3509	180	75	44%
1/3/2005	21FLGW 3509	180	75	44%
12/18/2007	Pasco County data	180	75	44%
7/23/2009	Pasco County data	180	75	44%
5/6/2010	Pasco County data	180	75	44%
11/29/2005	Pasco County data	190	80	47%
6/8/2011	Pasco County data	190	80	47%
1/6/2004	21FLGW 3509	200	82	48%
5/3/2004	21FLGW 3509	200	82	48%
2/5/2008	21FLGW 3509	200	82	48%
3/4/2008	21FLGW 3509	200	82	48%
5/10/2006	Pasco County data	200	82	48%

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
11/3/2010	Pasco County data	200	82	48%
7/11/2011	Pasco County data	200	82	48%
7/16/2008	21FLGW 34707	210	89	52%
10/9/2003	21FLGW 3509	210	89	52%
2/3/2004	21FLGW 3509	210	89	52%
9/3/2008	21FLGW 3509	210	89	52%
10/12/2009	21FLGW 37942	210	89	52%
2/15/2006	Pasco County data	210	89	52%
6/18/2003	21FLGW 17955	220	95	56%
4/3/2007	21FLGW 3509	220	95	56%
10/19/2011	Pasco County data	220	95	56%
7/7/2009	21FLGW 3509	230	98	57%
8/4/2010	Pasco County data	230	98	57%
1/12/2006	21FLGW 3509	240	100	59%
11/14/2006	Pasco County data	240	100	59%
2/3/2010	Pasco County data	240	100	59%
9/6/2007	21FLGW 3509	260	103	60%
10/8/2009	21FLGW 37947	260	103	60%
1/3/2007	21FLGW 3509	270	105	61%
6/2/2009	21FLGW 3509	270	105	61%
2/3/2005	21FLGW 3509	280	107	63%
2/24/2012	Pasco County data	280	107	63%
1/8/2002	21FLGW 3509	290	109	64%
6/3/2008	21FLGW 3509	290	109	64%
1/5/2010	21FLGW 3509	290	109	64%
3/7/2011	Pasco County data	290	109	64%
6/1/2004	21FLGW 3509	295	113	66%
4/1/2008	21FLGW 3509	300	114	67%
7/1/2008	21FLGW 3509	300	114	67%
5/1/2002	Pasco County data	300	114	67%
7/14/2008	21FLGW 34702	310	117	69%
10/1/2008	21FLGW 3509	320	118	69%
11/5/2008	21FLGW 3509	320	118	69%
8/29/2006	Pasco County data	320	118	69%
2/8/2011	Pasco County data	320	118	69%
9/18/2011	Pasco County data	320	118	69%
1/6/2009	21FLGW 3509	330	123	72%
2/7/2007	Pasco County data	330	123	72%
6/19/2008	21FLGW 34682	340	125	73%
8/8/2006	21FLGW 3509	350	126	74%
3/6/2007	21FLGW 3509	350	126	74%
1/27/2009	Pasco County data	370	128	75%
6/25/2008	21FLGW 34680	380	129	76%
8/2/2004	21FLGW 3509	390	130	76%
11/3/2009	21FLGW 3509	390	130	76%

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
12/7/2010	21FLGW 3509	390	130	76%
10/10/2006	21FLGW 3509	400	133	78%
9/6/2006	21FLGW 3509	420	134	79%
2/5/2007	21FLGW 3509	420	134	79%
1/31/2012	Pasco County data	440	136	80%
2/7/2002	21FLGW 3509	460	137	80%
12/6/2006	21FLGW 3509	460	137	80%
6/24/2008	21FLGW 34687	470	139	81%
1/3/2008	21FLGW 3509	480	140	82%
6/25/2008	21FLGW 34693	500	141	83%
10/9/2007	21FLGW 3509	550	142	83%
12/2/2009	21FLGW 3509	560	143	84%
11/6/2007	21FLGW 3509	570	144	84%
7/10/2008	21FLGW 34700	580	145	85%
6/11/2003	21FLGW 17963	590	146	86%
8/5/2008	21FLGW 3509	590	146	86%
7/6/2010	21FLGW 3509	590	146	86%
3/4/2002	21FLGW 3509	600	149	87%
2/4/2003	21FLGW 3509	600	149	87%
3/30/2010	21FLGW 3509	610	151	89%
7/11/2006	21FLGW 3509	618	152	89%
9/7/2005	21FLGW 3509	636	153	90%
3/3/2009	21FLGW 3509	640	154	90%
8/8/2007	21FLGW 3509	650	155	91%
6/23/2008	21FLGW 34694	730	156	91%
2/3/2009	21FLGW 3509	730	156	91%
11/12/2008	Pasco County data	830	158	93%
2/7/2002	Pasco County data	900	159	93%
12/2/2008	21FLGW 3509	950	160	94%
12/4/2007	21FLGW 3509	1200	161	94%
7/15/2008	21FLGW 34703	1400	162	95%
3/2/2010	21FLGW 3509	1400	162	95%
7/16/2008	21FLGW 34706	1800	164	96%
8/3/2010	21FLGW 3509	1800	164	96%
6/1/2005	21FLGW 3509	2000	166	97%
7/14/2008	21FLGW 34699	2100	167	98%
6/23/2008	21FLGW 34688	2200	168	99%
11/8/2006	21FLGW 3509	2200	168	99%
11/2/2010	21FLGW 3509	2800	170	100%

In this TMDL the Hazen formula was used to calculate percentiles since it is recommended in Hunter's Applied Microbiology (2002) article concerning bacteria in water. To calculate the percentile associated with the sample concentrations, the data is first sorted by concentration, lowest to highest. A ranking is assigned to each sample, with the lowest concentration having

a rank of 1 and the highest concentration having a rank equivalent to the total number of samples collected. The percentile is calculated as follows:

Percentile = (Rank – 0.5)/ (total number of samples collected)

For example, for WBID 1440F on June 19, 2008, a fecal coliform concentration of 340 counts/100 ml was measured at station 21FLGW 34682. This concentration ranks number 125 out of 170 samples collected in WBID 1440F. The associated percentile is calculated as:

Percentile = (125-0.5)/170 = 0.73 = 73%

This implies that 73 percent of the time, the instream concentration is less than 340 counts/100 ml.